VOLUME CONTENTS Volume 26

Vol. 26 No. 1 February 1996

CHRISTOF BÖHLER, AUBREY R. HILL, JR. and LESLIE E. ORGEL / Catalysis of the Oligomerization of O-Phospho-Serine, Aspartic Acid, or Glutamic Acid by Cationic Micelles 1–5

VERA KOLB and LESLIE E. ORGEL / Phosphorylation of Glyceric Acid in Aqueous Solution Using Trimetaphosphate 7–13

ANTHONY D. KEEFE and STANLEY L. MILLER / Potentially Prebiotic Syntheses of Condensed Phosphates 15–25

WILLIAM A. BONNER / Enantioselective Autocatalysis. IV. Implications for Parity Violation Effects 27–46

KLAUS DOSE and ANKE KLEIN / Response of *Bacillus subtilis* Spores to Dehydration and UV Irradiation at Extremely Low Temperatures 47–59

WANDA L. DAVIS and CHRISTOPHER P. McKAY / Origins of Life: A Comparison of Theories and Application to Mars 61–73

F.G. MOSQUEIRA, G. ALBARRÁN and A. NEGRÓN-MENDOZA / A Review of Conditions Affecting the Radiolysis Due to 4^0K on Nucleic Acid Bases and Their Derivatives Adsorbed on Clay Minerals: Implications in Prebiotic Chemistry 75–94

Announcement 95–96

Vol. 26 No. 2 April 1996

J.E. DICKENS, W.M. IRVINE, M. OHISHI, S. PITSCH, A. BAUDER, F. MÜLLER and A. ESCHENMOSER / A Search for Interstellar Oxiranecarbonitrile ($C_3H_3NO_3$) 97–110

ANTHONY D. KEEFE and STANLEY L. MILLER / Was Ferrocyanide a Prebiotic Reagent? 111–129

WOLFGANG HEINEN and ANNE MARIE LAUWERS / Organic Sulfur Compounds Resulting from the Interaction of Iron Sulfide, Hydrogen Sulfide and Carbon Dioxide in an Anaerobic Aqueous Environment 131–150

PING Z. DING, KUNIO KAWAMURA and JAMES P. FERRIS / Oligomerization of Uridine Phosphorimidazolides on Montmorillonite: A Model for the Prebiotic Synthesis of RNA on Minerals 151–171

VLADIMIR A. BASIUK and RAFAEL NAVARRO-GONZÁLEZ / Possible Role of Volcanic Ash-Gas Clouds in the Earth's Prebiotic Chemistry 173–194

Book reviews

Marie-Christine Maurel, Les Origines de la Vie (ALAIN FIGUREAU) 195–196

Vol. 26 Nos. 3–5 1996

(Abstracts Presented at ISSOL'96, July 1996, Orléans, France)

COMMENTARY
J.P. Ferris 197

ABSTRACTS PART ONE

Section 1 Production and properties of biogenic molecules

Abstract #

Overviews (o)

(o1.1) ENDOGENOUS SYNTHESIS OF PREBIOTIC ORGANIC MOLECULES
S.L. Miller 201–202

(o1.2) EXTRATERRESTRIAL ORGANIC CHEMISTRY: A SOURCE OF PREBIOTIC MOLECULES?
W.M. Irvine 203–204

Invited Paper (i)

(i1.1) SERPENTINIZATION OF OCEANIC CRUST AND FISHER-TROPSCH TYPE SYNTHESIS OF ORGANIC COMPOUNDS
N.G. Holm 205–206

Contributed Papers (c)

(c1.1) ORGANICS IN THE DIFFUSE INTERSTELLAR MEDIUM
F. Salama 207

(c1.2) FROM THE FORMATION OF BIOORGANICS IN INTERSTELLAR DUST TO THE THERMODYNAMICS OF SELF-ORGANIZATION IN COMETARY GRAINS AS SEEDS OF LIFE'S ORIGINS: ARE 10^{25} CHANCES ENOUGH?
J.M. Greenberg and F.R. Krueger 208–209

(c1.3) PRODUCTS OF THE STRECKER SYNTHESIS AS INDICATORS OF PARENT BODY CONDITIONS OF THE MURCHISON METEORITE
N.R. Lerner and G.W. Cooper 210–211

(c1.4) CURRENT STATUS OF ORGANIC ANALYSES OF ANTARCTIC CARBONACEOUS CHONDRITES
A. Shimoyama 212

(c1.5) SULFUR AND HYDROGEN ISOTOPE ANOMALIES IN ORGANIC COMPOUNDS FROM THE MURCHISON METEORITE
G.W. Cooper et al. 213–214

Abstract #

Invited Paper

(i1.2) MICROMETEORITES AND THE ORIGIN OF LIFE
M. Maurette 215–216

Contributed Papers

(c1.6) THE EXOGENOUS DELIVERY OF AMINO ACIDS TO THE MODERN EARTH: AN EVALUATION FROM POLAR ICES
J.L. Bada, et al. 217–218

(c1.7) METHANE CONCENTRATIONS IN THE EARTH'S PREBIOTIC ATMOSPHERE
J.F. Kasting and L.L. Brown 219–220

(c1.8) STRECKER SYNTHESIS USING AMMONIA FROM IRON(II) REDUCTION OF NITRITE: DO IRON(II) AND CYANIDE INTERFERE WITH EACH OTHER?
D.P. Summers and N. Lerner 221–222

(c1.9) PROSPECTS OF ORGANIC SYNTHESES BY VOLCANIC LIGHTNING
R. Navarro-González and V.A. Basiuk 223–224

(c1.10) AQUEOUS ORGANIC REACTIONS INDUCED BY HIGH ENERGY CONDITIONS, A NEW AREA OF RADICAL CHEMISTRY
K. Harada 225

(c1.11) NON-TRADITIONAL PATHWAYS OF EXTRATERRESTRIAL FORMATION OF PREBIOTIC ORGANIC SUBSTANCES
V.I. Goldanskii 226–227

(c1.12) GEOELECTROCHEMICAL PROCESSES IN CHEMICAL EVOLUTION
M.G. Vladimirov 228–229

(c1.13) AN EXPERIMENTAL INVESTIGATION OF THE IRON-SULFUR WORLD
A.D. Keefe et al. 230–231

Section 2 Biomonomers and biopolymers

Overviews

(o2.1) THE RNA WORLD: APPROACHES TO THE PREBIOTIC SYNTHESIS OF RNA
J.P. Ferris 232

(o2.2) THE ROLE OF CATALYTIC RNA IN THE ORIGIN AND EARLY EVOLUTION OF LIFE ON EARTH
G.F. Joyce 233–234

Invited Paper

(i2.1) PYRANOSYL-RNA
A. Eschenmoser 235

Abstract #

Contributed papers

(c2.1) EXOGENEOUS PHOSPHORUS COMPOUNDS IN EARLY CHEMICAL EVOLUTION
A.W. Schwartz 236–237

(c2.2) PREBIOTIC SYNTHESES OF THE RNA BASES: A CRITICAL ANALYSIS
R. Shapiro 238–239

(c2.3) MINERAL INDUCED SYNTHESIS OF RIBOSE PHOSPHATES
R. Krishnamurthy et al. 240–241

(c2.4) NON-ENZYMATIC ATP SYNTHESIS BY THE PHOSPHORYLATION OF ADP WITH THE ASSISTANCE OF CYANATE AND MAGNESIUM ION
Y. Yamagata 242–243

(c2.5) STUDIES IN PRIMITIVE CATALYSIS AND NUCLEOSIDE ANALOGS
M.C. Maurel et al. 244–245

Invited paper

(i2.2) HOMOCHIRALITY AS THE SIGNATURE OF EXTRATERRESTRIAL LIFE
A.J. MacDermott et al. 246–247

Contributed papers

(c2.6) ENANTIOMERIC ANALYSES OF CHIRAL ORGANIC COMPOUNDS FROM THE MURCHISON METEORITE
J.R. Cronin and S. Pizzarello 248

(c2.8) STRUCTURE AND FUNCTIONS OF SIMPLE PEPTIDES AT MEMBRANE–WATER INTERFACES
C. Chipot and A. Pohorille 249–250

(c2.9) ADENINE DERIVATIVES AS PHOSPHATE ACTIVATING GROUPS FOR PREBIOTIC RNA SYNTHESIS
K.J. Prabahar and J.P. Ferris 251–252

(c2.10) DOES REACTION IN CONCENTRATED MIXTURES OF ACTIVATED RIBONUCLEOTIDES FAVOR THE SYNTHESIS OF 3′5′-AS OPPOSED TO 2′5′-LINKED DIMERS?
A. Kanavarioti 253

(c2.11) STUDIES ON THE ADSOPRTION AND BINDING OF NUCLEIC ACIDS ON CLAY MINERALS
E. Gallori et al. 254–255

(c2.12) THE INTERLOCKING PEPTIDE AND NUCLEOTIDE CYCLE INITIATED BY N-PHOSPHOAMINO ACIDS
Y.-F. Zhao and P.-S. Cao 256–257

(c2.13) SELECTION OF RNA-BINDING PEPTIDES FROM COMBINATORIAL LIBRARIES
Kazuo Harada et al. 258

Abstract #

Public Lecture

(lct2) THE HISTORY OF LIFE
C. de Duve 259–260

Section 3 Replication – Autocatalysis – Genetic Code

Overview

(o3.1) OVERVIEW ON RNA AND RNA ANALOGUE REPLICATION
L.E. Orgel 261

Invited paper

(i3) THE ORIGIN OF BIOLOGICAL INFORMATION
M. Eigen 262

Contributed papers

(c3.1) LOOKING FOR CATALYSIS IN THE TEMPLATE-DIRECTED NON-ENZYMATIC POLYMERIZATION OF RNA: ACRIDINE-LABELLED OLIGONUCLEOTIDES AS A TOOL FOR THE RAPID AND PRECISE DETERMINATION OF CHAIN ELONGATION KINETICS
M. Kurz et al. 263–264

(c3.2) MINIMAL SYNTHETIC SELF-REPLICATION SYSTEMS – A HOST GUEST APPROACH
C.A. Booth et al. 265–266

(c3.3) AN EXPERIMENTAL APPROACH TO EXON SHUFFLING: MOLECULAR MUTAGENESIS OF BARNASE
H. Yanagawa et al. 267–268

(c3.4) *IN VITRO* SELECTION OF NOVEL LIGASE RIBOZYMES
A.J. Hager and J.W. Szostak 269

(c3.5) SELF REPLICATION AND CHEMICAL SELECTION IN PRIMORDIAL MUTUALLY CATALYTIC SETS
D. Lancet 270–271

Section 4 Self-assembly – Early metabolism – Early life

Overviews

(o4.1) OVERVIEW ON PRIMITIVE MEMBRANES
P.L. Luisi 272–273

(o4.2) THE EARLY FOSSIL AND GEOLOGICAL RECORDS – AN OVERVIEW
G. Vidal 274–275

Abstract #

Invited paper

(i4.1) MOLECULAR TAPHONOMY OF MEMBRANE CONSTITUENTS. THE SEARCH FOR THE MOST PRIMITIVE MEMBRANES
G. Ourisson and Y. Nakatani 276–277

Contributed papers

(c4.1) GEOCHEMICAL PLAUSIBILITY OF BIOMIMETICAL MATERIALS ARISING FROM SILICATE/CARBONATE COPRECIPITATION INTO ALKALINE MEDIA
J.M. García-Ruiz 278–279

(c4.2) BACTERIOPHAGE AS A MODEL FOR THE STUDY OF SELF-ASSEMBLY
B. Poglazov 280

(c4.3) ON THE EMERGENCE OF FUNCTIONS IN THE ORIGIN OF LIFE
C. Blomberg 281–282

(c4.4) CARBON ASSIMILATION BY *HALOCOCCUS SALIFODINAE*, AN ARCHAEBACTERIAL ISOLATE FROM PERMIAN SALT DEPOSITS
H. Stan-Lotter and K. Glaser 283

(c4.5) GENE DUPLICATIONS AND HORIZONTAL GENE TRANSFER DURING EARLY EVOLUTION
J.P. Gogarten et al. 284–285

Invited paper

(i4.2) POSSIBLE STRATEGIES IN METABOLISM OF EARLY MICROBIAL LIFE
K.O. Stetter 286

Contributed papers

(c4.6) A SIMPLE ELECTROSTATIC PHOTODRIVEN PROTON PUMP ACROSS A LIPID BILAYER
D. Mauzerall and K. Sun 287

(c4.8) THE ORIGIN OF LIFE AND THE EVOLUTION OF THE PHOTOSYNTHETIC METABOLIC PATHWAYS
H. Hartman 288–289

(c4.9) THE MELDING OF MORPHOLOGY AND MOLECULAR PHYLOGENY: INSIGHT INTO ANCESTRAL PROKARYOTIC PHENOTYPES
J.L. Siefert and G.E. Fox 290

(c4.10) FUNCTIONAL PHYLOGENY: THE USE OF THE SENSITIVITY OF RIBOSOMES TO PROTEIN SYNTHESIS INHIBITORS AS A TOOL TO STUDY THE EVOLUTION OF ORGANISMS
C. Briones et al. 291–292

Abstract #

(c4.11) THE ROOTING OF THE TREE OF LIFE: STILL AN OPEN QUESTION
P. Forterre 293–294

(c4.12) ISOTOPIC EVIDENCE FOR CHANGES IN THE BIO-GEOCHEMICAL CARBON CYCLE DURING THE EARLY AND MID-PROTERZOIC EON: IMPLICATIONS FOR THE BIOSPHERE AND ATMOSPHERE
D.J. Des Marais 295–296

(c4.13) NEW EVIDENCE FOR LIFE ON EARTH BY 3870 Ma
S. Mojzsis et al. 297–298

Invited lecture

(lct4) SUPRAMOLECULAR SELF-ORGANISATION AND THE HELICATE WORLD
J.M. Lehn 299

Section 5 Exobiology

Overviews

(o5.1) LIFE ON MARS
C.P. McKay 300

(o5.2) PLANETARY ATMOSPHERES
T. Owen 301

Invited Paper

(i5) EXOBIOLOGY IN EARTH ORBIT
G. Horneck 302

Contributed papers

(c5.1) VIABLE BACTERIA, METHANE AND HIGH ICE CONTENT IN ANTARCTIC PERMAFROST: RELEVANCE TO MARS
E.I. Friedmann et al. 303

(c5.2) SIMULATIONS OF THE VIKING BIOLOGY EXPERIMENTS USING PEROXIDE MODIFIED TITANIUM DIOXIDE
R.C. Quinn and A.P. Zent 304–305

(c5.3) POSSIBLE FORMATION OF ORGANIC COMPOUNDS ON MARS
K. Kobayashi et al. 306–307

(c5.4) MARTIAN EXOBIOLOGY: IMPLICATIONS OF MEASUREMENTS OF STABLE ISOTOPES
Bruce M. Jakosky 308–309

(c5.5) RETURN OF COMETARY MATERIAL TO EARTH BY THE NEW SPACE MISSION "STARDUST"
B.C. Clark 310

Abstract #

(c5.6) ORIGIN OF THE THREE BASE CODON COMPOSITION : A BROWNIAN REGIME MOLECULAR MACHINE APPROACH
G. Martínez-Mekler et al. 311

(c5.7) EVIDENCE THAT TRYPTOPHANASE HAD DEGRADED D-AMINO ACID IN EARLY METABOLISM
Akihiko Shimada 312

ABSTRACTS PART TWO

Posters (p)

(p1) QUANTUM RIDDLE AND BIOLOGICAL PRINCIPLE – NEWTON TO ARISTOTLE
N. Hokkyo 315

(p3) THE SEARCH FOR LIFE AND ITS ORIGINS: WHY NASA?
M.A. Meyer 316

(p4) ORIGINS OF LIFE AND EARLY EVOLUTION OF THE BIOSPHERE: A HOME PAGE ON THE WORLD WIDE WEB
D.W. Deamer 317

(p5) THE NASA SPECIALIZED CENTER OF RESEARCH AND TRAINING (NSCORT) IN EXOBIOLOGY
J.L. Bada et al. 318–319

(p6) "ORIGIN OF LIFE" IN MUSEUMS: HOW TO POPULARIZE THIS SCIENTIFIC FIELD?
F. Raulin-Cerceau 320

(p8) PREBIOTIC SYNTHESIS OF BIOORGANIC COMPOUNDS IN SIMULATED INTERSTELLAR DUST PARTICLES
T. Kasamatsu et al. 321–322

(p9) HYDROGENATION OF INTERSTELLAR MOLECULES: A SURVEY FOR METHYLENIMINE
W.M. Irvine and J.E. Dickens 323–324

(p10) INTERSTELLAR AND COMETARY ICES: MOLECULAR EMISSION FROM COMET 1996 B2
W.M. Irvine et al. 325–326

(p11) THE EFFECTS OF COMETS ON THE BIOTA
W.R. Sheldon 327–328

(p12) COMET PONDS AND THE ORIGIN OF LIFE
B.C. Clark 329

(p14) AMINO ACID ANALYSIS OF THE CRETACEOUS/TERTIARY BOUNDARY SEDIMENTS AT KAWARUPPU, HOKKAIDO, JAPAN
H. Mita and A. Shimoyama 330

(p15) PROOF OF EXOGENOUS DELIVERY OF ORGANICS TO THE EARLY EARTH IN THE SUDBURY IMPACT STRUCTURE
L. Becker and J.L. Bada 331

Abstract #		
(p16)	POLYHYDROXYLATED COMPOUNDS IN THE MURCHISON METEORITE?	
	G. Cooper	332–333
(p18)	ARCHEAN URANIUM DEPOSITS AND THE ORIGIN OF LIFE	
	L. Garzón	334–335
(p20)	EXPERIMENTAL SIMULATION OF ARCHEAN VOLCANIC LIGHTNING: POWER MEASUREMENTS	
	A. Romero and R. Navarro-Gonzales	336–337
(p21)	ALKYL CHLORIDES IN THE PRIMITIVE EARTH: IMPLICATIONS FOR PREBIOTIC CHEMICAL EVOLUTION	
	C. Estévez	338–339
(p22)	ROLE OF NITRILES AND OTHER REACTIVE MOLECULES IN CHEMICAL EVOLUTION	
	M.S. Chorha	340
(p23)	FORMATION OF SIMPLE REDUCED ORGANIC COMPOUNDS FROM MINERAL CARBONATES	
	G. Albarrán	341
(p24)	IMMEDIATE SYNTHESIS OF AMINO ACIDS IN HOT PLASMA WITH MAGNETO-PLASMA DYNAMIC ARCJET	
	S. Miyakawa et al.	342–343
(p25)	FORMATION OF AMINO ACIDS BY UV-IRRADIATION OF AMINE SOLUTIONS	
	A. Shimoyama et al.	344
(p26)	THE PREBIOTIC SYNTHESIS OF ETHYLENEDIAMINE MONOACETIC ACID, THE REPEATING UNIT OF PEPTIDE NUCLEIC ACIDS	
	K.E. Nelson and S.L. Miller	345–346
(p27)	ABIOTIC FORMATION OF URACIL FROM SIMULATED PRIMITIVE EARTH ATMOSPHERE	
	T. Tsuji and K. Kobayashi	347–348
(p28)	THE PREBIOTIC SYNTHESES OF N^6-METHYLADENINE, 1-METHYLADENINE AND 1 METHYLHYPOXANTHINE	
	M. Levy and S.L. Miller	349–350
(p29)	PHOTOCHEMICAL SYNTHESIS OF PREBIOTIC PHOSPHONIC ACIDS	
	R.M. De Graaf and J. Visscher	351
(p30)	ORIGIN OF SACCHARIDES AND THEIR ROLES ON EVOLUTION OF LIFE	
	J. Hirabayashi	352–353
(p31)	PHOSPHITE-BASED PHOTOPHOSPHORYLATION OF NUCLEOSIDES	
	W.J. Hagan Jr.	354
(p32)	KINETICS OF THE DECOMPOSITION OF RIBOSE AND OTHER SUGARS: IMPLICATIONS FOR CHEMICAL EVOLUTION	
	R. Larralde et al.	355–356

Abstract #

(p33) THE HYDROLYSIS OF DIHYDROURIDINE AND RELATED COMPOUNDS
C.H. House and S.L. Miller 357–358

(p34) THE SENSITIZATION MECHANISM OF PHOSPHATE EFFECT ON PHOTOLYSIS OF CYTOSINE AND CYTIDINE UNDER MEDIUM PRESSURE MERCURY ARCS IRRADIATION AND THE INHIBITION EFFECT OF AMINO ACID
W. Wenqing et al. 359–360

(p36) SURFACE ACTIVE MINERALS IN GEOCHEMICAL MODEL REACTIONS
S. Pitsch et al. 361–362

(p37) BEHAVIOR OF AMINO ACIDS IN HOT ENVIRONMENTS CONTAINING SILICATE MINERALS
V.A. Basiuk and R. Navarro-Gonzalez 363–364

(p38) STUDIES ON THE ADSORPTION OF NUCLEIC BASES AND THEIR DERIVATIVES ON SODIUM MONTMORILLONITE IN THE CONTEXT OF PREBIOTIC CHEMISTRY
L. Perezgasga et al. 365–366

(p41) STUDIES ON METAL FERROCYANIDES AS PREBIOTIC CATALYST
Kamaluddin 367

(p42) CORRELATION BETWEEN OPTICAL AND CRYSTALLOGRAPHIC PROPERTIES, AND CATALYTIC BEHAVIOR OF CLAYS WITH ABSORBED COMPOUNDS OF PREBIOTIC IMPORTANCE
S. Ramos-Bernal et al. 368

(p44) THE BUBBLE-AEROSOL-DROPLET CYCLE: A PREBIOTIC GEOCHEMICAL REACTOR (THAT MUST HAVE BEEN)
L. Lerman 369–370

(p45) PREBIOTIC SYNTHESIS OF N-CARBAMOYLAMINO-ACIDS, PROMISING INTERMEDIATES FOR PEPTIDES SYNTHESIS
A. Commeyras et al. 371–372

(p46) POLYMERIZATION OF AMINO ACIDS
R. Liu and L.E. Orgel 373

(p48) PHOTOMETRICALLY DETECTED HYDROLASE AND DEHYDROGENASE ACTIVITIES OF DIPEPTIDES
M. Shimizu 374–375

(p49) OLIGOMER WORLD: ORIGIN OF LIFE
M. Shimizu 376–377

(p50) SUBSTRATE DIRECTED FORMATION OF SMALL BIOCATALYSTS UNDER PREBIOTIC CONDITIONS
E. Kochavi et al. 378

(p51) INDUCTION OF PHOSPHATASE-LIKE ACTIVITY IN γ-IRRADIATED AQUEOUS SOLUTIONS OF GELATIN AND POLYGLYCINE: VERIFICATION OF AKABORI HYPOTHESIS
M. Akaboshi et al. 379

Abstract #

(p52) A ROLE FREE RADICALS IN THE EVOLUTION OF LIFE OF THE EARTH
A.A. Iskakov and K.M. Lvov 380

(p53) STRUCTURAL INVESTIGATIONS OF HYDROGEN CYANIDE POLYMERS
R. Minard et al. 381–382

(p54) ADSORPTION OF PROTEIN ON METAL FERRO-CYANIDES
S. Viladkar and Kamaluddin 383

(p55) CONFORMATIONAL DIVERSITY OF GLU-LEU SEQUENCES AND ITS PREBIOTIC RELEVANCE
A. Brack et al. 384

(p56) CONFORMATIONAL TRANSITION OF SECONDARY STRUCTURES OF PEPTIDE FRAGMENTS AND THEIR NONGENETICAL SELF-PROPAGATION
H. Yanagawa et al. 385–386

(p58) ENANTIOTOPIC RECOGNITION OF MESO-DIAMINES BY CHIRAL HOSTS
G.S. Hanan et al. 387

(p59) SEPARATION OF HOMOCHIRAL PEPTIDES AND HETEROCHIRAL PEPTIDES IN THE DEVELOPMENT OF HOMOCHIRALITY
T. Munegumi and A. Shimoyama 388–389

(p60) THE RACEMIZATION AND ISOMERIZATION OF THE ASP-151 RESIDUE IN αA-CRYSTALLIN IS INDUCED BY ULTRAVIOLET B IRRADIATION
N. Fujii et al. 390

(p62) FORMATION OF RNA OLIGOMERS ON MONTMORILLONITE: SITE OF CATALYSIS
G. Ertem and J.P. Ferris 391

(p63) KINETICS AND MECHANISTIC INVESTIGATIONS FOR OLIGONUCLEOTIDE FORMATION FROM 5′-PHOSPHORIMIDAZOLIDE OF ADENINE, URIDINE AND INOSINE ON NA^+-MONTMORILLONITE
K. Kawamura and J.P. Ferris 392–393

(p64) SYNTHESIS OF OLIGO (A,U)s BY MONTMORILLONITE CATALYSIS
G. Ertem and J.P. Ferris 394–395

(p65) ORIGIN OF RIBONUCLEIC ACIDS
B.E. Prieur 396

(p66) AN APPROACH TO PREBIOTIC SYNTHESIS OF RNA CONTAINING α-GLYCOSIDIC LINKAGE AND PROPERTIES OF THE RESULTING OLIGO α-RNA
H. Sawai et al. 397

(p67) A NEW AMIDE-LINKED POLYNUCLEOTIDE ANALOG
M. Harris and D. Usher 398–399

Abstract #

(p68) COMPARISON OF OLIGONUCLEOTIDE ANALOGUES, POSSIBLE PRECURSORS OF NUCLEIC ACIDS
Y. Merle and L. Merle 400–401

(p69) AUTOMORPHIC STRUCTURES AND MOLECULAR EVOLUTION
J. Tohá and M.A. Soto 402

(p70) INSIGHTS INTO EVOLUTION OF RNA-STRUCTURES
S. Kopp et al. 403–404

(p71) FURTHER EVIDENCE FOR THE POLY-tRNA THEORY ON THE ORIGIN OF mRNA AND GENETIC CODES: POLY-tRNA STRUCTURE IN THE *BACILLUS SUBTILIS rrnB* OPERON IS ALSO A RELIC OF AN EARLY PEPTIDE-SYNTHESIZING RNA MOLECULE
K. Ohnishi 405–406

(p72) COMPARATIVE ANATOMY OF GROUP I INTRONS AND RELATED RNA'S
K. Ohnishi et al. 407–408

(p73) ORIGIN AND EVOLUTION OF PROTEIN-MODULE-ENCODING EXONS
K. Ohnishi and H. Yanagawa 409–410

(p74) THE GEOCHEMICAL STABILITY OF DNA
X.S. Wang and J.L. Bada 411

(p75) THE RELATIVE REACTIVITY OF DEOXYRIBOSE AND RIBOSE: DID DNA COME BEFORE RNA?
J.P. Dworkin and S.L. Miller 412–413

(p76) STRUCTURE AND FUNCTION OF NUCLEIC ACIDS AFFECTED BY HIGH PRESSURE
A. Krzyżaniak et al. 414–415

(p77) EVOLUTION OF INTERACTION
C.V. Forst and C. Reidys 416–417

(p78) COMPUTER STEREO-CHEMICAL ANALYSIS OF THE INTERACTION BETWEEN AMINOACYL NUCLEOTIDES AND DINUCLEOTIDES ON THE BASIS OF THE PROGENE HYPOTHESIS
S.A. Khairetdinov et al. 418–419

(p79) RESOLVING THE ROLES OF SELECTION AND SELF-ORGANIZATION IN RNA EVOLUTION
E. Schultes et al. 420

(p81) PNA's – A PREBIOTIC TEMPLATE? ENANTIOMERIC CROSS-INHIBITION ON THE NONCHIRAL TEMPLATE AND THE REARRANGEMENT OF PEPTIDE NUCLEIC ACIDS IN AQUEOUS SOLUTION
J.G. Schmidt et al. 421–422

(p82) A COOPERATIVELY COUPLED SYSTEM BASED ON THE 3SR-REACTION
R. Ehricht et al. 423–424

(p83) A MINIMAL SELF-REPLICATING SYSTEM BASED ON THE DIELS-ALDER REACTION
D. Philp and A. Robertson 425–426

Abstract #

(p84) A CATEGORIZATION OF PREBIOTIC SELF-REPRODUCIBLE SYSTEMS
F.G. Mosqueira 427–428

(p85) LIPOSOMES AS CELL PRECURSORS: SELF-REPRODUCTION OF COMPARTIMENTED STRUCTURES
P.L. Luisi and P. Walde 429–430

(p86) NATURE'S OTHER REPLICATOR
A.G. Cairns-Smith 431

(p87) THE APPROACHES TO A SEARCH OF EVOLUTIONARY ROOTS OF THE INFORMATIONAL CODING SYSTEMS
V.A. Otroshchenko 432

(p88) AMINO ACID DETERMINATION OF THE GENETIC CODE ASSIGNMENTS. SUBMOLECULAR BASIS OF HEREDITY
O.V. Davydov 433–434

(p89) ANTICOMPLEMENTARY ORDER IN THE GENETIC CODING SYSTEM
R.C. Guimarães 435–436

(p90) ORIGIN OF THE GENETIC CODE
B.E. Prieur 437–438

(p91) PRIMORDIAL DOUBLE-STRANDED CODE AND DOUBLE-STRAND USE IN ORIGINS OF tRNAs AND COGNATE SYNTHETASES
S. Rodin et al. 439–441

(p92) A NEW MANIFESTATION OF THE ARITHMETICAL REGULARITY SUGGESTS THE UNIVERSAL GENETIC CODE DISTINGUISHES THE DECIMAL SYSTEM
V.I. Shcherbak 442–443

(p93) STATISTICAL ESTIMATION OF RUMER'S TRANSFORMATION OF THE UNIVERSAL GENETIC CODE
O.A. Zhaksybayeva 444–445

(p94) IS THERE ANY EVIDENCE OF A PRECELLULAR RNA WORLD?
M. Rizzotti 446–447

(p95) AQUEOUS PHASE SEPARATION: A BASIC PHYSICO-CHEMICAL PHENOMENON WITH A POTENTIAL ROLE IN THE EVOLUTION AND ORGANIZATION OF THE LIQUID PHASE OF CYTOPLASM
H. Walter and D.E. Brooks 448–449

(p96) FULLY DEUTERATED ALIPHATIC HYDROCARBONS OBTAINED FROM IRON CARBIDE TREATED WITH DCl AND D_2O
C. Marquez et al. 450–451

(p97) LIPOIC GEL EMULSION, AN EXPERIMENTAL MODEL OF THE PRECELLULAR STATE
R. Scorei et al. 452–453

(p100) THE ORIGIN OF LIFE: THE 'CELLS FIRST' APPROACH REVISITED
V. Norris and D.J. Raine 454–455

Abstract #

(p101) SELF-ASSEMBLY OF LIPID DROPLETS AND POLYRIBONUCLEOTIDES OR PRIMORDIAL SOUP REVISITED
E. Süleymanoğlu and N. Çoruh 456

(p103) HUSK-LIKE MICROCAPSULE FORMATION IN MATERIAL SELF-ASSEMBLY
S. Sakurazawa et al. 457

(p104) A POSSIBLE PREBIOTIC HEAT ENGINE
K. Matsuno 458

(p105) MAJOR ANASTROPHIC EVENTS FOR THE ORIGIN OF BIOLOGICAL ENERGY CONVERSION
H. Baltscheffsky and M. Baltscheffsky 459

(p106) MULTIPLICATION OF LIVING SYSTEMS IN THE ABSENCE OF MOLECULAR CARRIERS OF FREE ENERGY
V. Gusev et al. 460–461

(p107) ORIGIN OF BIOCHEMICAL ORGANIZATION AND CELLULAR METABOLISM
A.E. Lyubarev and B.I. Kurganov 462

(p108) SULFUR METABOLISM: THE EARLIEST ENERGY-OBTAINING PATHWAY OF THE PROKARYOTES?
D. Moreira and R. Amils 463

(p109) HYPERTHERMOPHILES AND THE GEOCHEMICAL ORIGIN OF METABOLISM
E. Shock et al. 464–465

(p111) THE METABOLIC WORLD; SUGARS AS AN ENERGIZED CARBON SUBSTRATE FOR PREBIOTIC AND BIOTIC SYNTHESIS
A.L. Weber 466–467

(p112) PROVISION OF REDOX POTENTIAL ENERGY FOR THE FIRST METABOLISM AT OCEAN-FLOOR WARM SEEPAGES
A.J. Hall and M.J. Russell 468–469

(p113) COENZYME PHOTORECEPTORS AS A FIELD FOR STUDIES OF THE EVOLUTIONARY CONTINUITY OF METABOLIC SYSTEMS
M.S. Kritsky 470–471

(p114) PHOSPHATE DEPOSITION IN THE PRESENCE AND ABSENCE OF CELLULAR ORGANISMS
G. Arrhenius and B.C. Sales 472–473

(p115) SALT CONCENTRATION OF THE PRIMITIVE SEA AND ORIGIN OF THE LIFE
H. Nakamura 474

(p116) A VIRUS-LIKE MOLECULE IN THE EARLY STAGE OF ENCODED MOLECULAR EVOLUTION
N. Nemoto et al. 475–476

(p118) THE ORIGIN OF PROTOCELLS
A.D. Altstein 477–478

Abstract #

(p120) THE PRINCIPAL MECHANISM OF PROBIONTS ORIGIN IN HYDROTHERMAL SYSTEMS INTERIOR
V. Kompanichenko 479–480

(p121) A NOVEL APPROACH TO MOLECULAR EVOLUTION STUDY
A. Figureau and M.A. Soto 481

(p122) ANALYSIS OF AMINOACYL tRNA SYNTHETASE FROM ARCHAEBACTERIUM, *HALOBACTERIUM SALINARIUM*
M. Ishigami and H. Ihara 482–483

(p123) ATP SYNTHESIS IN VESICLES FROM *HALOBACTERIUM SACCHAROVORUM*: INVESTIGATION INTO THE NATURE OF THE ATP SYNTHASE
D.M. Faguy and L.I. Hochstein 484

(p124) THE BIOSYNTHESIS OF HISTIDINE ON *GIARDIA LAMBLIA*
J.I. Leguina et al. 485–486

(p125) AN EUKARYOTIC-TYPE DNA TOPOISOMERASE IS PRESENT IN *HALOBACTERIUM HALOBIUM*
A. Becerra and A. Lazcano 487

(p126) THE ROLE OF GENE DUPLICATION IN THE PATCHWORK ASSEMBLY OF NUCLEIC ACID BASE SALVAGE PATHWAYS
A. Becerra and A. Lazcano 488

(p127) DIRECTED EVOLUTION EXPERIMENTS IN HISTIDINE BIOSYNTHESIS
E. Mori et al. 489–490

(p128) EARLY EVOLUTION OF THE HISTIDINE BIOSYNTHETIC PATHWAY
R. Fani et al. 491–492

(p129) BACTERIAL OPERONS CONTAINING COMPONENTS OF THE TRANSLATION MACHINERY ARE OF GREAT ANTIQUITY
G.E. Fox et al. 493

(p130) MICROSTRUCTURE ANALYSIS IN STROMATOLITES FROM THE TARAHUMARA FORMATION IN SONORA, MEXICO
E. Cacón-Baca and S. Cevallos-Ferriz 494

(p131) ELECTRON MICROSCOPE STUDIES OF FOSSIL BACTERIA AND THE SEARCH FOR BIOGENIC STRUCTURES IN PRECAMBRIAN ROCKS
F. Westall 495–496

(p133) BIOLOGICAL EFFECTS OF SOLAR ACTIVITY
T.K. Breus et al. 497–498

(p134) ON THE ORIGIN OF DIPLOIDY AND DIPLOID SPECIES: HOMOLOGOUS CHROMOSOME-PAIRING AS KINSHIP-RECOGNIZING CO-OPERATIVE BEHAVIOUR OF UNICELLULAR HAPLOID INDIVIDUALS
K. Ohnishi 499–500

Abstract #		
(p135)	PROTEROZOIC PROKARYOTIC TO EUKARYOTIC LIFE IN THE LESSER HIMALAYA, INDIA V.C. Tewari	501
(p136)	ON THE ORIGIN OF METAZOAN CALCIFICATION P. Westbroek and F. Marin	502
(p140)	A SEARCH FOR EXTRATERRESTRIAL EUKARYOTES: PHYSICAL AND BIOCHEMICAL ASPECTS OF EXOBIOLOGY J. Chela-Flores	503–504
(p142)	UV-PROCESSING OF AMINO ACIDS AND PEPTIDES IN EARTH ORBIT B. Barbier et al.	505–506
(p143)	GAS CHROMATOGRAPHY IN SPACE: CAPILLARY AND MICROPACKED COLUMNS FOR IN SITU ANALYSIS OF EXTRATERRESTRIAL ORGANIC COMPOUNDS R. Sternberg et al.	507–508
(p144)	ORIGINS OF LIFE: A COMPARISON OF THEORIES AND ANALOGY TO MARS W.L. Davis and C.P. McKay	509
(p145)	SIGNALS FROM PAST LIFE IN ANTARCTIC PALEOLAKE SEDIMENTS AND RELEVANCE TO FUTURE MARTIAN FOSSIL HUNTS P.T. Doran and R.A. Wharton, Jr.	510–511
(p146)	PLANNING FOR MARS SAMPLE RETURN: IMPLEMENTING PLANETARY PROTECTION PROTOCOLS IN THE FACE OF SCIENTIFIC UNCERTAINTY M.S. Race and J.D. Rummel	512
(p147)	FLUID-MIXING AND ORGANIC SYNTHESIS ON EARLY MARS M. Schulte and E. Shock	513–514
(p148)	BIOMARKERS AS TRACERS FOR LIFE ON EARLY EARTH AND MARS B.R.T. Simoneit et al.	515–516
(p149)	THE DEVELOPMENT OF INSTRUMENTATION HAVING UTILITY FOR EXOPALEONTOLOGICAL PROSPECTING ON MARS T.J. Wdowiak et al.	517
(p150)	AMINO ACID HOMOCHIRALITY ON EARTH AND MARS J.L. Bada	518–519
(p151)	SPECTROSCOPIC ANALYSIS OF MARS SOIL ANALOGS – TECHNIQUES FOR MINERALOGIC CHARACTERIZATION OF MARS AND DETECTION OF ORGANIC MATERIAL OF CARBONATES J.L. Bishop	520–521
(p152)	DURATION OF AQUEOUS SEDIMENTATION AND FAVORABLE ENVIRONMENT FOR LIFE INCEPTION ON MARS: A CASE IN AEOLIS REGION N.A. Cabrol and E.A. Grin	522–523

Abstract #

(p153) ORGANIC PHOTOCHEMISTRY IN THE ATMOSPHERE OF JUPITER AND SATURN
J.C. Guillemin et al. 524

(p154) PROVENANCE OF THE ORGANIC DEBRIS CLOUDS ON JUPITER DUE TO THE IMPACT OF COMET SHOEMAKER-LEVY 9
J.R. Lyons 525–526

(p155) HYDROGEN CYANIDE POLYMERS FORM THE IMPACT OF COMET P/SHOEMAKER-LEVY 9 ON JUPITER
C. Matthews 527–528

(p156) COMET SHOEMAKER-LEVY 9, JUPITER, AND IMPACT SHOCK CHEMISTRY
K. Zahnle 529–530

(p157) SEARCH FOR ORGANICS ON A COMET NUCLEUS FROM CHARGE EXPERIMENT
P. Mahaffy et al. 531

(p158) COMPUTER MODELING OF THE THERMAL CONDUCTIVITY OF COMETARY ICE
M.A. Wilson and A. Pohorille 532

(p159) IN-SITU ANALYSIS OF THE CONDENSED AND THE SOLID PHASES OF TITAN'S ATMOSPHERE WITH THE ACP/HUYGENS EXPERIMENT
G. Israël et al. 533

(p160) CORONA DISCHARGE IN A SIMULATED TITAN'S ATMOSPHERE
S.I. Ramírez and R. Navarro-Gonzalez 534–535

(p161) OBSERVATIONS OF INTERSTELLAR GLYCINE
M. Ohishi and S.-I. Ishikawa 536

(p162) FROM PANSPERMIA TO BIOASTRONOMY, WHAT ABOUT THE EVOLUTION OF THE HYPOTHESIS OF AN UNIVERSAL LIFE?
F. Raulin-Cerceau et al. 537

Announcement: Planetary systems – the long view

Author Index

Vol. 26 No. 6 December 1996

AUBREY R. HILL JR. and LESLIE E. ORGEL / Oligomerization of Negative-Charged Amino Acids by Carbonyldiimidazole 547–553

WEIHUA ZHOU, YONG JU, YUFEN ZHAO, QINGGANG WANG and GUOAN LUO / Simultaneous Formation of Peptides and Nucleotides from N-Phosphothreonine 554–568

SHIRO MORIMOTO, KATUHIRO KAWASHIRO, MUNETOSHI WATANABE and AKIHIRO OHSAKI / 2-Aminopropionitrile Polymer. I. The Hydrolyzate of the Basic Fraction 569–595

MASSIMO DIGIULIO / The β-Sheets of Proteins, the Biosynthetic Relationships between Amino 597–617

Book reviews

Michael P. Murphy and Luke A.J. O'Neill: *What is Life? The Next Fifty Years. Speculations on the future of biology* (A.G. CAIRAS-SMITH) 619–621